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| BEYER WEAVER LLP       |             |                      | EXAMINER                |                  |
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| OAKLAND, CA 94612-0250 |             |                      |                         |                  |
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Commissioner for Patents

See the attached Examiner's Answer, signed PTO-1449 filed on 05/07/07, and PTO-892 with attached English translation for Ohmi et al., WO 98/39500.

A handwritten signature in cursive script, appearing to read 'Luz L. Alejandro', is positioned above the printed name.

Luz L. Alejandro  
Primary Examiner  
Art Unit: 1763



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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/040,326  
Filing Date: January 03, 2002  
Appellant(s): HAO ET AL.

**MAILED**  
**SEP 06 2007**  
**GROUP 1700**

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Marc S. Hanish  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 5/11/07 appealing from the Office action mailed 4/19/06.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

Appellant correctly mentions the claims involved in this appeal, claims 22-23, 25, 27-32, 34-37, 39, 41-45, 47, 49, 51-52, 54-55, 60-61, 63, and 65-68. However, it should be noted that claims 38, 40 and 62 are also pending in the application but have been withdrawn from consideration as not directed to the elected species.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is substantially correct. It should be noted that the independent claims 22, 34, and 49, recite the open language of "comprising" rather than the closed language of "consisting", as wrongly stated in the summary of the invention.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: the only grounds of rejection presented for review on appeal are:

A) Claims 22-23, 25, 27-32, 49, 51-52, 54-55, 60-61, 63 and 65-66 rejected under 35 U.S.C. 112-first paragraph;

B) Claims 22-23, 25, 27-32, 49, 51-52, 54-55, 60-61, 63 and 65-66 rejected under 35 U.S.C. 112-second paragraph (with respect to the clarity of the language of independent claims 22 and 49); and

C) Claims 22-23, 25, 27-32, 34-37, 39, 41-43, 47-49, 51-55 and 65-67 rejected under 35U.S.C. 103(a) as being unpatentable over Tamura et al., US Patent 5,792,304 in view of Ohmi et al., WO 98/39500.

**WITHDRAWN REJECTIONS**

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner.

A) Claims 22-23, 25, 27-32, 60-61, 63 and 65-66 rejected under 35 U.S.C. 112-second paragraph (with respect to the use of the term "generally" in the independent claim 22).

B) Claims 22-23, 25, 27-31, 48-49, 51-55, 60-61, 63, and 65-66 rejected under 35 U.S.C. 102(b) as being anticipated by Masuda et al., US Patent 6,171,438.

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C) Claims 22-23, 25, 27-31, 48-49, 51-55, 63, and 65-66 rejected under 35 U.S.C. 102(b) as being anticipated by Wicker et al., US Patent 6,129,808.

D) Claims 32, 34-37, 39, 41-45, 47, and 67-68 rejected under 35 U.S.C. 103(a) as being unpatentable over Masuda et al., US Patent 6,171,438.

E) Claims 32, 34-37, 39, 41-43, 47, and 67 rejected under 35 U.S.C. 103(a) as being unpatentable over Wicker et al., US Patent 6,129,808.

F) Claims 44-45 and 68 rejected under 35 U.S.C. 103(a) as being unpatentable over Wicker et al., US Patent 6,129,808, as applied to claims 32, 34-37, 39, 41-43, 47, and 67, and further in view of Masuda et al., US Patent 6,171,438.

G) Claims 60-61 rejected under 35 U.S.C. 103(a) as being unpatentable over Wicker et al., US Patent 6,129,808, as applied to claims 22-23, 25, 27-31, 48-49, 51-55, 63, and 65-66, and further in view of Masuda et al., US Patent 6,171,438.

#### **(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

#### **(8) Evidence Relied Upon**

|              |               |         |
|--------------|---------------|---------|
| US 5,792,304 | Tamura et al. | 08-1198 |
| WO 98/39500  | Ohmi et al.   | 09-1998 |

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 22-23, 25, 27-32, 49, 51-52, 54-55, 60-61, 63, 65-66 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification, as filed, fails to describe an edge ring positioned on the chuck, as claimed on newly amended independent claims 22 and 49. It seems from the specification and the drawings that the substrate, instead of the edge ring, is positioned on the chuck.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 22-23, 25, 27-32, 49, 51-52, 54-55, 60-61, 63, 65-66 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "a generally planar edge ring disposed above said electrode and extending underneath a substrate when positioned on said chuck" in claim 22 and the phrase "a second component including a planar edge ring disposed underneath an outer region of the substrate when the substrate is positioned inside the process chamber for processing, and extending underneath a substrate when positioned on said chuck" in claim 49, are not clear since it appears from the specification and from the drawings of the instant invention that the substrate, instead of the edge ring, is positioned on the chuck.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 22-23, 25, 27-32, 34-37, 39, 41-43, 47-49, 51-55 and 65-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura et al., U.S. Patent 5,792,304 in view of Ohmi et al., WO 98/39500.

Tamura et al. shows the invention substantially as claimed including a pedestal for supporting a substrate 1 during plasma processing, the pedestal comprising: an electrode 2 configured generating an electric field (see, for example, fig. 9 and col. 14, line 44-52); a chuck disposed above the electrode, the chuck being configured for holding the substrate and having an outer periphery that is smaller than an outer periphery of the substrate (see, for example, fig. 9 and col. 14, line 44-52); a generally planar dielectric edge ring 36 disposed above the electrode and extending underneath a substrate when positioned on the chuck, the edge ring being configured for shielding the electrode and the chuck with inner edge portions proximate an edge of the substrate and an edge of the chuck and an outer edge portion extending to one edge of the electrode, and including a first portion configured to be disposed between the electrode and the substrate when the substrate is held by the chuck (and configured to surround an outer edge of the chuck) and a second portion being configured to surround an outer edge of the substrate when the substrate is held by the chuck for processing whereby the edge ring cooperated with the chuck to form a recessed portion for accepting the substrate for processing. For a complete description, see for example, fig. 9 and its description).

Tamura et al. does not expressly disclose the claimed impedance matching layer disposed between the electrode and the edge ring. Ohmi et al., as described above,

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discloses an apparatus comprising a pedestal for supporting a substrate 108 during plasma processing, the pedestal including an impedance matching layer 104 disposed and confined between an electrode 101 and an edge ring 103, the impedance matching layer made of a dielectric material and has characteristics configured for controlling an impedance between the electrode and a plasma in order to improve the processing uniformity across the surface of the substrate and make impedances substantially equal at different regions underneath the substrate (see, for example, figs. 1, 6A, 6B, 7B, 9, 26A-26I, and their descriptions). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the pedestal of the Tamura et al. as to comprise an impedance matching layer disposed between the electrode and the edge ring, as taught by Ohmi et al., in order to improve the processing uniformity across the surface of the substrate and thereby optimizing the apparatus.

With respect to claims 23, 25, 27, the impedance matching layer of the apparatus of Tamura et al. modified by Ohmi et al., will reduce variations in the electric field, is arranged to control the impedance between the electrode and the plasma at the edge of the substrate, is configured to be disposed between the electrode and the substrate when the substrate is held by the chuck. Regarding claim 32, the chuck, edge ring and impedance matching layer are formed from a dielectric material, wherein the dielectric constant of the edge ring may be equal to the dielectric constant of the chuck (note that both the chuck and the edge ring can be made of  $\text{Al}_2\text{O}_3$ ), and wherein the dielectric constant of the impedance matching layer may be different than the dielectric constant of the edge ring and the chuck. Furthermore and with respect to claim 33, it should be

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noted that a first impedance produced through the chuck is different than a second impedance produced through the edge ring, and wherein the impedance matching layer may be arranged to adjust the second impedance produce through the edge ring so that the second impedance is substantially equal to the first impedance produced through the chuck.

With respect to claim 34, note that the chuck is disposed in an inner region of the electrode, the edge ring is disposed above the outer region of the electrode and positioned next to a side of the chuck, and the impedance matching layer is disposed between the edge ring and the electrode and above the outer region of the electrode.

Regarding claims 36-37 and 41, note that the impedance matching layer of the apparatus of Tamura et al. modified by Ohmi et al., is bonded to both the edge ring and the electrode by screw 112, the electrode has an outer periphery that is greater than the outer periphery of the substrate when the substrate is disposed on the chuck for processing.

Regarding claims 49, 53 and 54-55, note in the pedestal of Tamura et al. modified by Ohmi et al., the first component is the chuck, the second component is the edge ring, and the third component is the electrode.

Regarding claim 65, note that as broadly claimed the substrate region can be considered to be any region within the region of the lower electrode.

With respect to the impedance matching layer being bonded to the edge ring through a silicon elastomer, it would have been obvious to one of ordinary skill in the art at the time the invention was made to bond these elements through a silicon elastomer

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because this is a well established means of bonding elements in a plasma processing apparatus.

Claims 44-45, 60-61, 63, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura et al., U.S. Patent 5,792,304 in view of Ohmi et al., WO 98/39500 as applied to claims 22-23, 25, 27-32, 34-37, 39, 41-43, 47-49, 51-55 and 65-67 above, and further in view of Masuda et al., U.S. Patent 6,171,438.

Tamura et al. and Ohmi et al. are applied as above but do not expressly disclose a heat transfer system as claimed. Masuda et al. discloses a plasma processing apparatus comprising a pedestal including a heat transfer system for controlling the temperature of the substrate and the edge ring during processing, the heat transfer system including a first channel extending through the electrode to the interface between the chuck and the substrate, and a second channel extending through the electrode to the interface between the electrode and the edge ring, the heat transfer system being configured to provide a heat transfer medium through the channels, wherein the heat transfer is a helium gas (see fig. 2 and its description). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Tamura et al. modified by Ohmi et al. as to comprise the heat transfer system disclosed by Masuda et al. because this allows for effective and efficient temperature control of the substrate and the edge ring without incorporating a complicated mechanism.

Tamura et al. and Ohmi et al. are applied as above but do not expressly disclose the claimed limitation of claims 60-61 and 63. Masuda et al., as described above, discloses an apparatus comprising a pedestal having an electrode formed of a conductive material and the edge ring, the chuck and the impedance matching layer are made of a dielectric material (see, for example, col. 8. lines 44-63). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Tamura et al. modified by Ohmi et al. as to comprise an electrode, a chuck, an edge ring and the impedance matching layer made of the claimed material because such materials are known to be suitable material. Note that Masuda teaches that the edge ring and the chuck can be made of the same material such as alumina and the impedance matching layer can be made of a material having a larger dielectric constant such as SiC.

#### **(10) Response to Argument**

Appellant argues that independent claims 22 and 49 are in compliance with 35 U.S.C. 112- first and second paragraphs, because the claims in their present form are definite. The examiner respectfully disagrees and contends that the phrase "a generally planar edge ring disposed above said electrode and extending underneath a substrate when positioned on said chuck" in claim 22 and the phrase "a second component including a planar edge ring disposed underneath an outer region of the substrate when the substrate is positioned inside the process chamber for processing, and extending underneath a substrate when positioned on said chuck" in claim 49, are not clear since

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it appears from the specification and from the drawings of the instant invention that the substrate, instead of the edge ring, is positioned on the chuck. However, the language of the claims is confusing with respect to these limitations since it appears that applicant is claiming that the edge ring, instead of the substrate, is the element positioned on the chuck. Also note that the examiner agrees with applicant's proposed amendment to the claims to include the words -- the substrate is -- after the word "when" in the recited claimed language.

Appellant argues that reference number 36 in the Tamura et al. reference is not a generally planar edge ring disposed above the electrode, but rather is a cover for holding member 2, wherein the cover 36 functions to uniform the gas flow for substrate etching to be uniform. The examiner kindly disagrees with appellant's statement and respectfully contends that the susceptor 36 of the Tamura et al. reference: a) is generally planar; b) can work as the claimed edge ring; and c) the fact that applicant has recognized another advantage for the edge ring other than to uniform the gas flow for substrate etching to be uniform, cannot be the basis for patentability.

Appellant argues that there is no suggestion in the primary reference of Tamura et al. to be modified to further include the impedance matching layer of the secondary reference of Ohmi et al.. However, the examiner respectfully contends that the suggestion to combine the references does not need to be found in the primary reference of Tamura et al. but in the secondary reference of Ohmi et al. or in the knowledge of one of ordinary skill in the art.

Appellant argues that the pedestal as claimed would not result from the combination of Tamura et al. in view of the secondary reference of Ohmi et al.. The examiner respectfully disagrees and contends that all the elements of the claimed invention are disclosed/shown by the combination of the apparatus of Tamura et al. modified by the teaching of Ohmi et al., as clearly stated in the previous/above rejections of the claims.

In response to applicant's arguments against the references individually (Ohmi et al. does not disclose that the edge ring 103 extends underneath the substrate 108, nor does the edge ring 103 is located proximate to the edge of the substrate and the edge of the chuck), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, it should be noted that the primary reference of Tamura et al. is relied upon to show these features.


#### **(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

  
**LUZ ALEJANDRO-MULERO**  
**PRIMARY EXAMINER**

Conferees:

  
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**SUPERVISORY PATENT EXAMINER**

  
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